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REPLIES

Response to Berkson, Davis, & Strickler, 'What does incipient /ay/-raising look like?'

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Berkson, Davis, and Strickler (2017) provide an invaluable report on incipient /ay/-raising in Fort Wayne, Indiana. Their data suggest that /ay/-raising conditioned strictly by phonetic voicelessness is a possible early stage in the development of /ay/-raising. This raises a particularly vexing question of why /ay/-raising has gone on to be conditioned by phonological voicing in all North American varieties for which its interaction with /t, d/ flapping has been examined. It suggests that the process of phonologization reorganizes the distribution of phonetic variants, rather than simply discretizing phonetic precursors.

Keywords: Canadian raising, phonologization, incipient sound change, flapping, metrical foot

The documentation of incipient /ay/-raising in Berkson, Davis, & Strickler 2017 (henceforth BD&S) is an excellent example of the importance of carefully curated data collected in just the right place at just the right time. I believe that combining their results with the analysis of the time course of /ay/-raising in Philadelphia reinforces a point made in Fruehwald 2017: the best way to learn about how language changes is to examine language change in progress. In fact, in order to fully understand something like the ACTUATION PROBLEM, it may be necessary to adopt a nearly epidemiological survey approach, studying a speech community continuously, starting BEFORE it is clear that a change has begun. BD&S has very nearly done that, and undoubtedly a continuous survey of Fort Wayne will cast invaluable light on how a sound change moves from an incipient state to full phonologization.

In Fruehwald 2016 (henceforth F16), I expressed skepticism that a period of purely phonetic conditioning in Philadelphia even occurred. With BD&S's report, I have to conclude that it is both plausible and probable that there was a period of incipient phonetically conditioned raising in Philadelphia like there is currently in Fort Wayne, although it still stands on the basis of the quantitative analysis in F16 that it must have been too brief to be observable.

The rest of this response addresses the important descriptive contribution BD&S has made with respect to the nature of incipient /ay/-raising, a discussion of how BD&S's data further complexify the standard model of phonologization, and a discussion of the putative role of paradigm effects on phonologization.

1. THE NATURE OF INCIPIENT /ay/-RAISING. It was not at all clear what a purely phonetic stage of /ay/-raising ought to look like. As I pointed out in F16, if we assume that the shorter duration of /ay/ before voiceless segments is the phonetic precursor to /ay/-raising, then we should expect all preflap /ay/ to participate, since /ay/ is almost as short in this position as before surface [t]—that is, we should expect raising in *write*, *writer*, and *rider*, but not *ride*. This preflap shortening was replicated by BD&S. The mean durations for their speaker P (the phonetic raiser) are reproduced in Table 1 next to the means from F16, along with the percentage of the durations relative to [t]. These results are roughly comparable. In both reports, /ay/ is considerably shorter before flaps than before [d], although in F16 /ay/ before a *d*-flap is longer than before [t], while in BD&S it is shorter. Regardless, if we were to group these four contexts, /ay/ is shortest before {*t*-flap, *t*, *d*-flap} and longest before {*d*}.

PHONEME	REALIZATION	ms (F16)	% [t] (F16)	ms (BD&S)	% [t] (BD&S)
/t/	stop	146		177	
/t/	flap	135	92%	126	71%
/d/	flap	179	123%	146	82%
/d/	stop	228	156%	284	160%

TABLE 1. Comparison of contextual /ay/-duration between Fruehwald 2016 and Berkson, Davis, & Strickler 2017.

However, speaker P quite clearly does not exhibit raising before any flap, leading to raising only in *write*, meaning she has raising before the set {*t*}, and no raising before the set {*t*-flap, *d*-flap, *d*}. It would seem fairly conclusive, then, that a phonetic precursor for /ay/-raising is much more likely to be offglide peripheralization (Moreton & Thomas 2007) or gestural rephasing (Onosson 2010, Pycha & Dahan 2016) triggered by following phonetic voicelessness. From this point of clarity, much larger uncertainties arise about the process of phonologization.

2. /ay/-RAISING IS NOT WHAT THE STANDARD MODEL OF PHONOLOGIZATION PREDICTS. We cannot conclude with certainty that a Fort Wayne-like stage of /ay/-raising ever existed in Philadelphia, but if we DO propose such a stage it further reinforces arguments made in F16 that the commonsense accounts for the motivations of conditioned sound changes do not hold up against evidence from language change in progress. The distribution of variants throughout the time course of the /ay/-raising change in Philadelphia is different (conditioned by abstract phonology; BD&S pattern 3) from its initial state (conditioned by surface phonetics; BD&S pattern 2).

This mismatch problem is amplified if we do a cross-dialectal comparison of varieties for which preflap data have been explicitly reported. In Table 2, dialects for which there is a purely phonetic stage of incipient raising are compared with dialects that have matured into phonetically conditioned raising and those that have matured into phonologically conditioned raising. To my knowledge, NO variety has been reported to have matured into phonetically conditioned raising (i.e. without opaque raising before *t*-flaps). The only two varieties for which an incipient period of purely phonetic raising has been reported (Ontario, and now Fort Wayne) have subsequently undergone (or are undergoing) maturation into phonologically conditioned raising.

INCIPIENT PURELY PHONETIC RAISING	MATURING PURELY PHONETIC RAISING	MATURING PHONOLOGICAL RAISING
• Ontario (Joos 1942) • Fort Wayne, IN, patterns 1 & 2 (Berkson, Davis, & Strickler 2017)	• *None*	• Ontario (Chambers 1973, 1989) • Fort Wayne, IN, pattern 3 (Berkson, Davis, & Strickler 2017) • Ann Arbor, MI (Dailey-O'Cain 1997) • Victoria, BC (Rosenfelder 2005) • Philadelphia (Fruehwald 2016)

TABLE 2. Cross-dialectal comparison of incipient and mature /ay/-raising systems.

BD&S also argues that the very first instances of /ay/-raising, where the whole process is putatively initiated, was in pretonic contexts, like *citation* or *titanic*. However, these are meant to be contexts where raising is blocked in mature raising systems. BD&S argues this could be due to children applying metrical conditioning on the developing [ay] ~ [ʌy] allophony with the consequence that raising is initiated 'in environments where [it] seems to disappear after phonologization' (p. e182). It is an even

more surprising violation of the phonologization model if the process of phonologization could eliminate a variant in the context where it was originally most favored!

My discussion of (non)raising in pretonic /ay/ should be more judicious, however, since it has not been as thoroughly researched as the preflap factor, and BD&S could well be the first report to do so acoustically. Dailey-O'Cain (1997) found in Ann Arbor, MI, that the blocking of raising in pretonic context was not as absolute (78%) as raising before *t*-flaps (91%). Given the fact that F16 found a stationary effect of word frequency raising /ay/, which seems like a vowel-reduction effect, and given that there seems to be an across-the-board reduction in formant excursion in pretonic /ay/ in BD&S's figures, it could the case that some of the 'raising' in BD&S could actually be unstressed-vowel reduction.

Whether or not phonetic /ay/-raising began in the pretonic context, the collection of evidence in Table 2 is an exceptional challenge for the standard phonologization model. The phonologization model as proposed by Hyman (1976) and variously adopted, refined, or reinvented by many researchers has been successful in part for its conceptual simplicity and apparent descriptive adequacy. Phonetically natural and gradient tendencies (e.g. voicing F0 perturbation, nasal coarticulation, word-final devoicing) become exaggerated,[1] resulting in a phonologized pattern. As the term 'exaggeration' suggests, the phonologized process is meant to be similar in both character and distribution to the original phonetic tendency. It results in MORE nasalization of vowels before nasal consonants, and a LARGER drop in F0 following voiced obstruents. It is the distribution of phonetic motivations that creates the distribution of phonological variants. Under this model, evidence from phonology and evidence from phonetics have often been treated as being fully invertible. Commonly recurrent sound changes or sound distributions stand as evidence for phonetic precursors, and evidence of phonetic precursors stands as evidence for the motivations for such changes (e.g. Blevins 2006). The phonetic production and perception behavior of participants in the lab are taken as either proxies for or actual instantiations of the process of how sound change progresses (Ohala 1990, Beddor 2009, Yu 2013).

However, it has been noted before that the distribution of variants at the end of a sound change is not identical to the original distribution of phonetic motivations (see Buckley 2009 for discussion of three such cases), and the recurrent pattern of /ay/-raising cross-dialectally is an especially stark violation of the standard phonologization model. In this instance, the process of phonologization ALTERS the distribution of variants. Raised [ʌy] is extended to contexts where there is no phonetic bias for its presence, and it is eliminated from contexts where there IS a bias for its presence. If the facts of this case are generalizable, then it would mean that phonetic and phonological evidence are not readily invertible. That is, the distribution of phonological variants could not serve as evidence for the presence or absence of phonetic biases, and evidence of phonetic biases could not serve as evidence for the eventual distribution of phonological variants.

3. THE DIFFICULTY OF PARADIGM EFFECTS. In order to account for the spread of [ʌy] to all *t*-flap contexts, BD&S appeals to paradigm uniformity. This is essentially a resurrection of the NEOGRAMMARIAN CONTROVERSY (Labov 1981). Do phonemes change, or paradigms? However, the authors do bring some nuance to the discussion that should not be

[1] It is usually not made clear how an intrinsic phonetic tendency, by hypothesis outside of speakers' control, could be 'exaggerated' if it is, in fact, outside of speakers' control.

overlooked. They do not propose that the entire change progresses as a process of one paradigm leveling after another. Rather, it is just the transition from phonetic raising to phonologized raising that is facilitated by paradigm leveling. This would obviously have to be the case to eventually have raising in the words *title* and *item*, for example. Moreover, the small literature on lexically exceptional cases in raising (Vance 1987, Fruehwald 2008) does not report any examples of exceptionally unraised /ay/ before *t*-flaps, which might be expected if /ay/-raising failed to level across an entire paradigm.

If paradigm leveling contributes to the process of phonologization as BD&S suggests, then it would seem that once /ay/-raising is phonologized, paradigm effects are eliminated. F16 conducted a paradigm-based analysis, using the ratio of the frequency with which /ay/ appears before *t*-stops to the frequency with which it appears before *t*-flaps as a predictor of raising. For example, the *unite* paradigm has a stop : flap ratio of 0.08 (being dominated by *United*), while the *right* paradigm has a stop : flap ratio of 647 (a rare flapping item being *righty*). These asymmetries across paradigms appear to have no quantitative effect on the already phonologized system in Philadelphia, meaning that such paradigm effects on /ay/-raising ought to be restricted to just the early, rapid phonologization process.

A more detailed model of paradigm effects on phonologization is necessary, however, in order to account for both the cases where a contextual variant spreads across the entire paradigm and the cases where it does not. F16 pointed out a very similar conditioned sound change in Philadelphia that raises /ey/ preconsonantally. This change has phonologized in such a way that it cuts across paradigms, resulting in alternating vowel quality in items like *days* [dɪ̣iz] ~ *day* [dɛ̣i]. A wide range of possible explanations involving type and token frequencies within and across paradigms could potentially account for the paradigm uniformity in /ay/-raising and alternations within paradigms for /ey/-raising. But without a proposed mechanism for these paradigm effects, exploring these explanations would amount to the quantitative equivalent of throwing pasta at the wall until something sticks.

4. Under the phonologization and paradigm-leveling model, most things called 'sound change' are not. Figure 1 (reproduced from F16) plots the trajectory of /ay/-raising in Philadelphia. It shows the raising of the nucleus of prevoiceless /ay/ from a low position, slightly lower than the average /ɑ/ (LOT), to a mid position, about the same as the average /ʌ/ (STRUT). This raising was a phonetically continuous change that progressed across the twentieth century.

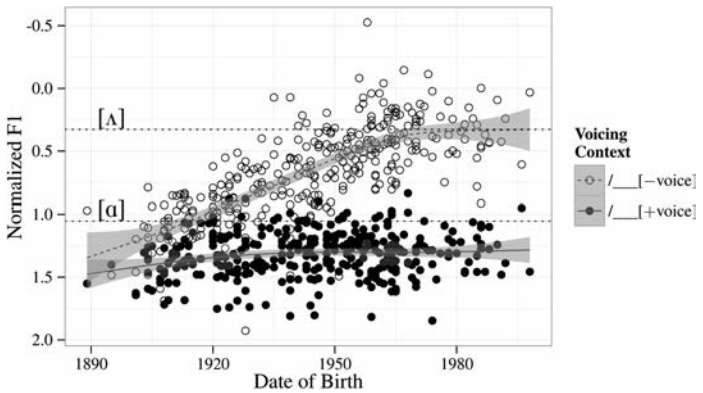

Figure 1. Prevoiceless /ay/-raising in Philadelphia. Reproduced from Fruehwald 2016.

If we adopt the model proposed in BD&S, however, we should be clear that Fig. 1 does not plot the process of phonologization or a 'sound change', depending on how that is to be understood. For the entirety of the timeframe displayed in Fig. 1, /ay/-raising is fully phonologized, as F16 took pains to demonstrate. If the phonologization of /ay/-raising to phonologically [−voice] contexts is an object of study for research on sound change, then it had already happened before the timeframe presented in Fig. 1. In fact, the entire process of phonologization sketched by BD&S, from phonetic raising to paradigm leveling to ultimate phonologization, must have occurred across an incredibly short interval. Figure 1 thus only illustrates the subsequent ENHANCEMENT of the phonologized sound change, guided and constrained by principles separate and apart from those that guided and constrained the phonologization itself. This is the 'BIG BANG' model of phonologization, so called by Janda and Joseph (2003).

If the big bang model of phonologization is correct, then it would seem that we are in the position of reasserting Hockett's position that sound change occurs too abruptly to be observable in most cases:

> No matter how gradual was the approach of early M[iddle] E[nglish] /ǽ/ and /ɔ́/ towards each other we cannot imagine the actual coalescence of the two other than as a sudden event … . Yet there is no reason to believe that we would ever be able to detect this kind of sudden event by direct observation. (Hockett 1958:456–57)

I would echo Weinreich, Labov, and Herzog's (1968:129) commentary on this model that 'it is difficult to accept an explanation through phenomena which are not only unobserved, but unobservable'. As BD&S has shown, however, the early stage of the phonologization model actually may be observable. What remains to be seen is how the phonologization of phonetic /ay/-raising could so thoroughly spread across an entire speech community before the relatively small phonetic difference could be enhanced. One fruitful possibility would be that multiple phonologizations of /ay/-raising were in use across the speech community, much like Mielke, Baker, and Archangeli (2016) found for distributions of bunched versus retroflex /r/, but only one eventually won out through coordination between speakers. This would seem plausible enough given the fact that BD&S's two illustrative speakers were relatively young, but one exhibited phonetic raising while the other did not. In this model, abstractly conditioned /ay/-raising is either the most commonly innovated conditioning at an individual level, or the most transmissible, or some mixture of the two.

5. CONCLUSION. In short, BD&S contributes important descriptive data and brings to the forefront some weighty theoretical issues in sound change and phonologization. It might seem strange that, given methodological and technological advances in the study of sound change, we are still wrestling over the same theoretical issues that Weinreich, Labov, and Herzog (1968) tried to address fifty years ago. Do phonemes change, or do changes spread paradigm by paradigm? Do sound changes actually occur too quickly to be observed, despite half a century of the study of supposed sound change in progress? This is just a testament to the theoretical difficulty of these problems that will not easily yield to small, medium, or big data.

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